

# NPOESS PREPARATORY PROJECT (NPP)

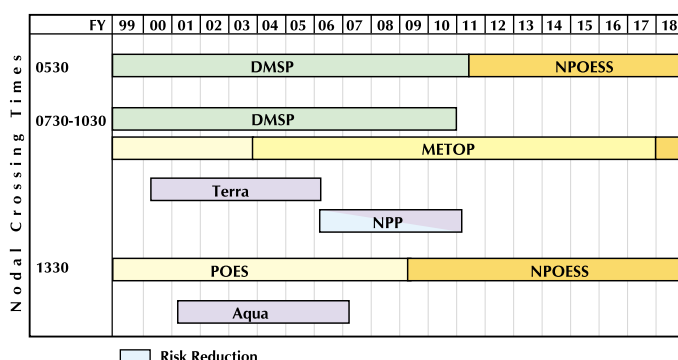
## A BRIDGE BETWEEN EOS AND NPOESS

### Mission Objectives

- Provide NASA with continuation of global change observations after Earth Observing System (EOS) Terra and Aqua
  - Atmospheric and sea surface temperatures, humidity sounding, land and ocean biological productivity, and cloud and aerosol properties
- Provide National Polar-orbiting Operational Environmental Satellite System (NPOESS) with risk reduction demonstration and validation for 3 of the 4 critical NPOESS sensors, algorithms, and processing.
  - VIIRS, CrIS, ATMS

#### JOINT MISSION OBJECTIVES

### Integrated Schedule



#### NPP "BRIDGES" EOS AND NPOESS

### Contributions to NPOESS

- Instrument Risk Reduction
  - Early delivery / instrument-level test / system-level integration and test
  - Provides lessons learned and allows for any required modifications in time to support NPOESS first launch readiness
- Ground System Risk Reduction
  - Early delivery and test of a subset of NPOESS - like ground system elements.
- Early User Evaluation of NPOESS data products
  - Provides algorithms / instrument verification and opportunities for instrument calibration / validation
  - Allows for algorithm modification prior to NPOESS first launch

#### VALIDATION OF CRITICAL INSTRUMENTS, ALGORITHMS, AND PROCESSING

### Contributions to NASA Earth Science

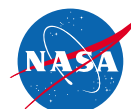
- Atmosphere:
  - Cloud Properties
  - Atmospheric Temperature
  - Atmospheric Humidity
  - Aerosol Properties
- Land Surface:
  - Vegetation Dynamics
  - Fire Occurrence
  - Surface Temperature
  - Volcanic Effects
- Cryosphere:
  - Sea Ice
  - Snow Cover
- Oceans:
  - Surface Temperatures
  - Phytoplankton and Dissolved Organic Matter

#### PROVIDES CONTINUITY FOR MANY EOS MEASUREMENTS

### Environmental Data Records and Science Data Products

- VIIRS
  - Imagery
  - Sea Surface Temperature
  - Soil Moisture
  - Aerosol Optical Thickness
  - Aerosol Particle Size
  - Suspended Matter
  - Precipitable Water (secondary)
  - Cloud Base Height
  - Cloud Cover / Layers
  - Cloud Effective Particle Size
  - Cloud Optical Thickness
  - Cloud Top Height
  - Cloud Top Pressure
- VIIRS (cont'd)
  - Cloud Top Temperature
  - Albedo (Surface)
  - Land Surface Temperature
  - Normalized Differential Vegetation Index
  - Snow Cover / Depth
  - Vegetation Index / Surface Type
  - Currents
  - Fresh Water Ice
  - Ice Surface Temperature
  - Littoral Sediment Transport
  - Net Heat Flux
  - Ocean Color / Chlorophyll
- VIIRS (cont'd)
  - Sea Ice Age / Edge Motion
  - Mass Loading / Turbidity
  - Active Fire Products
- CrIS/ATMS
  - Atmospheric Temperature Profile
  - Atmospheric Humidity Profile

Note: Some products may require non-NPP data sets



#### EXTENSIVE SET OF ENVIRONMENTAL DATA RECORDS AND SCIENCE DATA PRODUCTS

# A BRIDGE BETWEEN EOS AND NPOESS

## Mission Characteristics

Instruments:

- Visible Infrared Imaging Radiometer Suite (VIIRS)
- Cross-track Infrared Sounder (CrIS)
- Advanced Technology Microwave Sounder (ATMS)

Launch: 2005

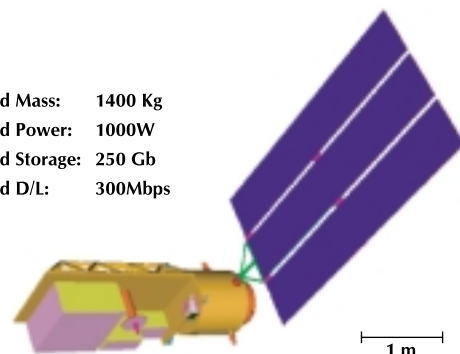
Orbit: 833 km, polar sun-synchronous, 10:30 a.m. descending node

Launch Site: Western Test Range

Mission Duration: 5 years

## NPP Spacecraft Concept

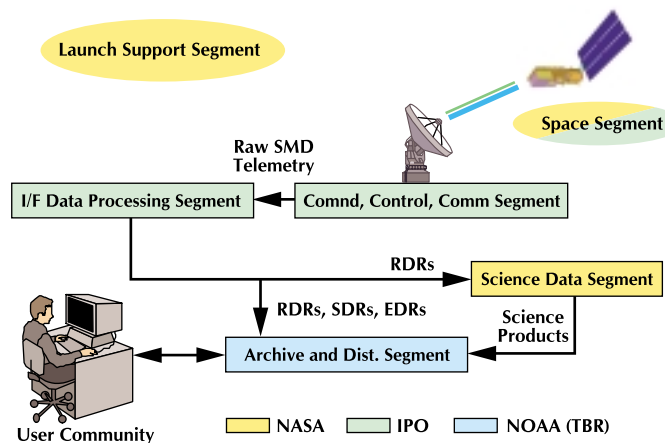
Estimated Mass: 1400 Kg  
 Estimated Power: 1000W  
 Estimated Storage: 250 Gb  
 Estimated D/L: 300Mbps



## Technology Demonstration Plan

- ATMS uses advanced technology low noise amplifiers for atmospheric sounding
- Ka-Band Phased Array for compact, high rate space-to-ground communications technology demonstration
- Ground Station Interface Facility (GSIF) for multi-satellite data multiplexing and buffering (technology transfer to NOAA)
- Optical communication LEO-LEO or LEO-GEO for rapid delivery of information products to users (option)

## Mission Architecture Concept



## Instruments

### Visible Infrared Imaging Radiometer Suite (VIIRS)

- Daily global observation of land, oceans, and atmosphere for climate research and weather forecasting
- Multispectral (visible through thermal infrared) scanning radiometer
- 3000 km swath, 200 Kg, 8 Mbps avg.

### Cross-Track Infrared Sounder (CrIS)

- In conjunction with ATMS, daily global observation of atmospheric temperature and humidity profiles
- Michelson interferometer infrared sounder covering 3.5 – 16  $\mu$ m
- 2300 km swath, 76 Kg, 1.5 Mbps avg.

### Advanced Technology Microwave Sounder (ATMS)

- In conjunction with CrIS, daily global observation of atmospheric temperature and humidity profiles
- Multi-channel Scanning microwave total power radiometer
- Advanced low noise amplifier technology enables ATMS to be ~ 1/3 size, weight, and recurring cost of heritage instruments (AMSU A1, A2, MHS)
- 2300 km swath, 66 Kg, 0.3 Kbps avg.

## Mission Partners

### NASA

- Mission systems engineering, integration, and test
- ATMS
- Spacecraft and integration
- Launch
- Science data segment

### NPOESS IPO

- Augmented VIIRS
- CrIS
- Command, Communications, Control Segment (C3S)
- Interface Data Processor Segment (IDPS)
- Mission Operations

